



THE UNIVERSITY *of* EDINBURGH

## Edinburgh Research Explorer

### Review of A. Janiak Newton as Philosopher

**Citation for published version:**

Massimi, M 2010, 'Review of A. Janiak *Newton as Philosopher*', *Philosophy*, vol. 85, pp. 157-163.  
<https://doi.org/10.1017/S0031819109990532>

**Digital Object Identifier (DOI):**

<http://dx.doi.org/10.1017/S0031819109990532>

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Publisher's PDF, also known as Version of record

**Published In:**

Philosophy

**Publisher Rights Statement:**

© Cambridge University Press. Massimi, M. (2010). Review of A. Janiak Newton as Philosopher. *Philosophy*, 85, 157-163

**General rights**

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



# Philosophy

<http://journals.cambridge.org/PHI>

Additional services for ***Philosophy***:

Email alerts: [Click here](#)

Subscriptions: [Click here](#)

Commercial reprints: [Click here](#)

Terms of use : [Click here](#)



---

## Reviews *Newton as Philosopher* By Andrew Janiak Cambridge University Press, 2008, £45 / \$90 ISBN 978-0-521-86286-8

Michela Massimi

Philosophy / Volume 85 / Issue 01 / January 2010, pp 157 - 163

DOI: 10.1017/S0031819109990532, Published online: 05 February 2010

**Link to this article:** [http://journals.cambridge.org/abstract\\_S0031819109990532](http://journals.cambridge.org/abstract_S0031819109990532)

### How to cite this article:

Michela Massimi (2010). Philosophy, 85, pp 157-163 doi:10.1017/S0031819109990532

**Request Permissions :** [Click here](#)

The role of physics may be more limited here than Bird would like to allow. Does physics really make claims about the dispositionality – or otherwise – of properties? CM will take talk of dispositions and powers (and ‘dynamical properties’) to be *made true* by objects with categorical properties and their relations to laws involving categorical properties. It will say that characterising a property dispositionally says nothing about its ultimate nature. But if so, how great a role can physics play when choosing between CM, MV and DM? Fortunately Bird has already shown DE to be a better theory than CM. As for the choice between MV and DM, perhaps all that can be said is that inasmuch as DM takes *all* fundamental properties to be potencies, it is *simpler* and so – if all else is equal – the theory to be preferred.

Bird’s exploration and defence of Dispositionalism is impressive. It is detailed, meticulously constructed and insightful, and should do a great deal to persuade philosophers of the position’s plausibility. The book is a demanding but very illuminating read.

**Simon Bostock**

### *Newton as Philosopher*

By Andrew Janiak

Cambridge University Press, 2008, £45 / \$90

ISBN 978-0-521-86286-8

doi:10.1017/S0031819109990532

Newton’s philosophy of natural science has been at the very heart of an important literature in history and philosophy of science, going back to A. Koyré’s *Newtonian Studies* in 1968, R. Westfall’s and I. Bernard Cohen’s monographs in the 70s and 80s (among many other authoritative studies, including Henry Guerlac, Hélène Metzger, and more recently George Smith, Howard Stein, and Robert DiSalle). This is an overcrowded field, where finding a new historical angle or developing a new philosophical analysis – while standing on the shoulders of such giants – may prove a daunting task. Andrew Janiak’s new book *Newton as Philosopher* fulfils the task successfully, and proves the good that can come from combining a historically accurate account with a philosophically compelling analysis. In the space of 178pp. Janiak masterfully steers his interpretive analysis through an extraordinarily rich historical material, while the philosophically rigorous narrative takes the reader from one chapter to the next in a compelling way. The final result is a brilliant book

## Reviews

that has an important story to tell about Newton's 'physical metaphysics', and it makes it an occasion for a thousand wider meditations.

The book articulates an interpretation of Newton that programmatically takes the distance from two influential views: (a) one contending that Newton eschewed the metaphysical issues underlying Descartes' metaphysical physics, to focus only on empirical and mathematical topics; and (b) the other (defended by Stein and DiSalle, more recently) claiming that Newton did not eschew metaphysical issues, but instead transformed *a priori* issues (e.g. causation) into empirical ones. While the first anti-metaphysical reading of *Principia* seems to find support in Newton's *mathematical* treatment of forces, and in his *causal agnosticism* – i.e. 'attraction' does not mean 'physical cause', hence Newton's methodological *hypothesis non fingo* – ; the second interpretation, by contrast, claims that Newton did not simply reject Descartes, Leibniz or Huygens' mechanical philosophy. Instead, he refused to speculate about what the physical basis of gravity, simply because he believed that gravity acted directly between bodies across empty space, and defended a non-mechanical view of causation.

Against both these interpretations, Janiak sets out to defend an alternative interpretation, based on a 'physical metaphysics' (as opposed to Descartes' 'metaphysical physics', whereby God is metaphysically and epistemically prior to physics). This third interpretation is based on a partial acceptance of Stein–DiSalle second interpretation: when it comes to mundane metaphysics (e.g. whether there are forces, how they act, and whether or not there is causation in nature), Newton transformed some *a priori* issues into empirical ones. But mundane metaphysics was part and parcel of a broader framework, including divine metaphysics, which while not subject to the methods of empirical investigation was at the same time an integral part of natural philosophy, as Newton clearly declared in the General Scholium to the second edition of *Principia* (1713): 'to treat of God from phenomena is certainly a part of natural philosophy'. Against DiSalle, Janiak claims that Newton never endorsed gravity as action at a distance between bodies in empty space, and that this was indeed germane to God's relation to space as spelled out in the General Scholium, whereby absolute space becomes the expression of God's omnipresence in nature.

To support this third interpretation, Janiak has to demonstrate that (1) gravity is to be understood as local and yet non-mechanical; and (2) that Newton's methodology is very different from the mechanical philosophers' one: his rejection of action at a distance never led him to underwrite a hypothesis concerning the 'cause of gravity'; nor did he

feign or endorse hypotheses, including his own ether hypothesis in the *Queries of Opticks*. Chapters 3 and 4 of Janiak's monograph are dedicated to spell out these two main points.

To prove that (1) gravity is to be understood as local and yet non-mechanical, in ch. 3 Janiak distinguishes between 'strict mechanism' and 'loose mechanism' (52). The former is Cartesian in claiming that all changes in nature occur through impact among material bodies with a certain size, shape and motion. The latter is Leibnizian in introducing forces but claiming that natural changes cannot occur via action at a distance. The mechanical philosophers, especially Leibniz in his 1689 *Tentamen*, posed then the following dilemma to Newton: either his notion of 'gravity' is unacceptable because it implies action at a distance; or, in order to avoid action at a distance, he had to deny gravity too.

But, *pace* Leibniz, Janiak argues that Newton could escape the dilemma and believe in the real existence of gravity, while also rejecting action at a distance as 'inconceivable' (both in his 1693 correspondence with Bentley, and in the General Scholium). Newton could defend gravity as local while escaping any mechanical conclusion – i.e. any vortex theory of gravity like the one developed by Leibniz in *Tentamen* – because, by contrast with Leibniz and other mechanical philosophers, he did not conflate local action with surface action. In Janiak's words: 'According to the overarching view that Newton would attribute to Leibniz, a cause must involve some mechanism – it must be "mechanical" – in the following two senses: (1) the cause cannot alter the state of motion of any material body at a spatial distance from it; and (2) it cannot alter the state of motion of any material body without impacting on one or more surfaces of that body... Newton's imagined physical theory of gravity based on the ether in query 21 of *Opticks* involves an acceptance of (1) but a rejection of (2) for the ether would act on bodies by 'penetrating' them' (76).

So, Newton left open the empirical question of whether or not there could be a future physical theory of gravity, but he also made it clear that such theory could not take the form of Leibniz's fluid-vortex theory, and must involve instead some form of pervasive ether. In sum, Janiak defends the view that Newton's ether – as a possible medium of gravity – would guarantee local action, and yet be non-mechanical in the sense that it would not involve surface action, but would instead flow through material bodies and interact directly with their masses. Thus, by contrast with Westfall, who in *Force in Newton's Physics* (American Elsevier, 1971) famously argued that Newton introduced the brand new concept of force to the ontology of nature, Janiak argues that the brand new concept

## Reviews

Newton introduced was instead mass, not force. Mass, and mass alone, is salient for gravity; and to prove this point Janiak turns to Cotes' preface to the second edition of *Principia*.

Roger Cotes, astronomer at Trinity College, Cambridge, wrote a famous preface where he defended Newtonian gravity from the accusation of being an occult quality and hailed it as a universal quality of all bodies. But Newton begged to differ. For Newton, gravity could not be a primary universal quality, because (i) it diminishes with the distance (unlike mass, extension, impenetrability that do not increase or diminish with the distance), and (ii) it may well be a property of the ether or of some other medium. Thus, while playing down the role of gravity as a primary universal quality, Newton effectively introduced a brand new concept of mass, which – according to Janiak – marked the real novelty compared to the previous mechanical philosophy.

For Descartes, the 'quantity of matter' (or mass) involved only extension: the world was a plenum and any material body was extended and characterised by size, shape, and motion. For Newton, in addition to extension, quantity of matter involves the density of the extended body. Moreover, for Newton, we can learn the mass of a body by weighing it, although mass and weight are distinct. Indeed, Newton introduced a key distinction between inertial and gravitational mass, which was absent in Descartes, and had two important effects: (I) it could account for Galileo's discovery that all bodies fall with the same acceleration; (II) it allowed to obtain mass from weight defined as resistance of a body to acceleration, and, as such, mass became a measurable quantity.

Janiak concludes then that for Newton the essence of matter is mass, not the force of gravity, which is in turn defined in terms of mass. So, gravity is not an occult quality because it is proportional to mass, and mass is ultimately a measurable quantity. Most importantly, this brand new Newtonian concept of mass is congenial to an epistemology of material objects, according to which we cannot ascribe properties *a priori*, as with Descartes' *res extensa*. Instead, the properties of matter have to be defined via experiments and via the concepts of a physical theory (e.g. via Newton's second law that defines the concept of weight as resistance to gravitational acceleration).

To sum up, according to Janiak, Newton's non-mechanical conception of causation – i.e. there can be local action that does not involve impact or surface action among material bodies – is germane to his non-mechanical ontology, whereby matter is non-mechanical in the specific sense clarified above. The question

remains as to whether there is a medium (ether or other) as the ‘physical cause’ of gravitational interaction among bodies.

This last point leads finally Janiak’s discussion towards the problem of absolute space. In *De gravitatione* (an unpublished manuscript written most probably before the 1678 *Principia*) Newton defended the thesis that space is an affection of being – be it God, human minds, or material bodies – because any being exists by occupying a certain space and a certain time, including human minds (by contrast with Descartes’ *res cogitans*, which is not extended in space). Thus, space and time are affections of all beings, including God; and since God exists always and everywhere, space and time exist always and everywhere, but they exist *uncaused* – as opposed to being efficiently caused by God. In other words, they exist contingently, because their existence depends on the existence of something else (bodies, mind, or God); but they are notionally distinct from the entity whose existence their existence depends on. Hence, space and time are affections, as opposed to substances that would exist even if nothing existed (hence, the expression ‘substantivalism’ to refer to Newton’s view of space and time is potentially misleading).

But how is it possible to reconcile the affection thesis of *De gravitatione* with Newton’s later claim in the Scholium to *Principia* that space and time exist independently of all other things? Janiak mentions two possible readings of Newton’s absolute space and time: (a) *strong absolutism*, space and time exist independently of every entity, including God; and (b) *weak absolutism* i.e. space and time exist independently of all material objects, but depend only on God for their existence. Weak absolutism is compatible with *De gravitatione*, and also with the famous discussion of God and space in the General Scholium of the second edition of *Principia* (1713). Most importantly, Newton’s weak absolutism is congenial to his view of natural philosophy as including the study of God, which is the topic of the last chapter of Janiak’s book.

In the final chapter, Janiak clarifies why Newton did not regard physics as logically prior to metaphysics: he claims that Newton’s physical theory did not in fact provide any compelling reason to reject action at a distance, nor did it provide any compelling reason for thinking of space as absolute (in the strong or weak sense). According to Janiak, Newton never regarded the possibility of action at a distance as empirical, and his understanding of action, like his understanding of God’s place in the physical world, is instead part of a metaphysical framework that is not subject to revision through the development of empirical science.

## Reviews

Newton's God is spatiotemporally ubiquitous and actively omnipresent. Admitting action at a distance would have forced Newton to re-think God as acting non-locally, and hence would have removed one of the main reasons for thinking God as spatiotemporally ubiquitous. It is this overarching metaphysical framework that – according to Janiak's interpretive analysis – ultimately explains some of Newton's controversial views about gravity, mass, space, and time. Newton's metaphysics concerns the same type of substances that physics is concerned with: spatiotemporally local substances – whether finite or infinite, contingent or necessary. But this overarching metaphysical framework, i.e. the study of God as part of natural philosophy, is not itself physical, nor is it subject to revision in the light of empirical evidence.

The doubt remains as to whether God's omnipresence, via spatiotemporal ubiquity, should necessarily be understood and construed in non-mechanical terms, as Janiak consistently argues throughout the book. After all, as Westfall noted, Newton's spatiotemporally ubiquitous God, like his all-pervasive ether of the *Opticks*, were meant to provide, respectively, a non-material and a material medium for the locality of gravity. Indeed, while the ether – on which Newton had abundantly speculated in some of the still largely Cartesian (pre-*Principia*) unpublished manuscripts – was officially absent in the first edition of *Principia* (1687) and *Opticks* (1704), it re-appeared in their second editions. In particular, it re-appeared in the General Scholium appended to the second edition of *Principia* (1713), and in the new Queries attached to the second English edition of *Opticks* (1717) to explain electricity, magnetism, optical phenomena, and gravity, among others.

Westfall (*op. cit.*, 395) ventured an explanation of this resurrection of the ether: '[Newton] introduced the ether to provide a mechanical explanation of forces which had appeared so occult to a generation raised on the mechanical philosophy', although 'composed of particles repelling each other, the ether embodied the very problem of action at a distance which it pretended to explain'. Newton's ambiguity on the ether can be explained by bearing in mind that there was another candidate in Newton's natural philosophy for the semi-mechanical and semi-dynamical role of the ether, namely God himself as an 'incorporeal ether who could move bodies without offering resistance to them in turn' (*ibid.*, 397), which is perfectly germane to Newton's idea of space and time as the *sensorium* of God.

Thus, while on Westfall's reading, Newton rejected the mechanical philosophers' accusation of gravity being an occult quality by playing their own game and introducing a semi-mechanical explanation of



gravity in terms of a (material or immaterial) medium; on Janiak's alternative reading, Newton's rejected the accusation by showing that gravity is reducible to mass, and mass in turn is a measurable quantity. Of course, whether or not there are semi-mechanical residues in Newton's natural philosophy depends on how we define mechanical philosophy and what counts as 'mechanism' or 'mechanical cause'; and this remains an open issue, as Janiak himself seems to acknowledge.<sup>1</sup> The price that Janiak has to pay for his thorough going non-mechanical interpretation of Newton's natural philosophy consists in playing down the concept of gravitational force with the ensuing problem of its 'physical basis', in favour of mass.

Interpretive nuances notwithstanding, the final picture that Janiak's monograph delivers is the picture of a Newton, whose physical speculations about gravity and mass and life-long polemic with Cartesian and Leibnizian mechanical philosophy, are part and parcel of an overarching metaphysical view of God's role in nature. Far from eschewing metaphysical issues or transforming them into empirical ones, Janiak's Newton sheds new light on the vexed issue of the relationship between Newton's physics and his metaphysical and religious beliefs, and on how the latter informed and illuminated the former. As such, Janiak's monograph offers an essential contribution to the ever-growing field of history and philosophy of science, and proves once more what can be achieved by masterfully integrating intellectual history of science with philosophy.

**Michela Massimi**

<sup>1</sup> For example, the historian Robert E. Schofield (*Mechanism and materialism. British Natural Philosophy in an age of Reason*, Princeton University Press, 1970, 15) offers a different definition of mechanical philosophy: 'From the dynamic corpuscularity of the early *Principia* and the first two editions of the *Opticks*, historically evolving from the mechanical philosophy of the seventeenth century, came the conviction of the mechanists that causation for all the phenomena of nature was ultimately to be sought in the primary particles. . . the various sizes and shapes of possible combinations of these particles, . . . and the forces of attraction and repulsion between them.' Given this definition, Newton's dynamic corpuscularity, i.e. his view that matter consists of corpuscles endowed with attractive and repulsive forces, originated from and, in turn, engendered a mechanical view of nature – very different from the Cartesian one – which nonetheless played a key role in the development of British and Dutch natural philosophy in the eighteenth century.